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ABSTRACT

This program guide presents the standard appliance servicing technician curriculum for technical institutes in Georgia. The general information section contains the following: purpose and objectives; program description, including admissions, typical job titles, and accreditation and certification; and curriculum model, including standard curriculum sequence and lists of courses. The next three sections contain the courses: general core courses (consumer education, English, general mathematics, interpersonal relations and professional development); fundamental occupational courses (refrigeration fundamentals, electrical fundamentals, electric motors, appliance controls fundamentals, and safety); and specific occupational courses (laundry appliances I-II, kitchen appliances I-II, refrigeration appliances I-II, microwave ovens, and household appliance servicing occupation-based instruction). Each course consists of the following: a course overview (description, competency areas, prerequisites, credit hours, contact hours); course outline with student objectives and class and lab hours; and resource list. An appendix to the guide lists equipment and tools needed for the program and nine additional resources. (NLA)

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GEORGIA DEPARTMENT OF TECHNICAL AND ADULT EDUCATION

APPLIANCE SERVICING PROGRAM GUIDE

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APPLIANCE SERVICING PROGRAM GUIDE

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APPLIANCE SERVICING PROGRAM GUIDE

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Without the close cooperation of members of the appliance servicing profession in Georgia, this program guide would not have been possible. The Appliance Servicing State Technical Committee provided overall direction, identified areas of concern, provided occupational outlook and equipment recommendations, participated in task analysis review, and reviewed the curriculum in this guide. We would like to recognize each member of the Appliance Servicing State Technical Committee below.

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Fox Appliance Parts

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HOW TO USE THIS MANUAL

Summary

This manual is divided into:

Tabs - major divisions, physically separated by numbered tab dividers

Sections - divisions within a tab

Subjects - divisions within a section

Numbering System

Each document (Subject) has a unique 6-digit number. This number is divided into 3 sets of 2 digits which are separated by dashes.

Example:	04	-	02	-	03
	TAB		SECTION		SUBJECT

Locating a Document

Document numbers appear on the upper right hand corner of each page (see top of this page). To locate a subject:

1. Refer to the Table of Contents.
2. Note the document number for the subject.

   Example: 04-02-03

3. Turn to the tab divider marked 04 and within this tab find Section 02 and Subject 03.

Table of Contents

The table of contents (00-00-01) is intended to give a cover-to-cover overview of the manual contents and organization. It lists contents of a Tab to the Section and Subject level.

Amendments

Registered manual holders are instructed to keep their manuals up-to-date.

Manuals Document Transmittal	All new or revised documents are sent to the registered holder of the manual and are recorded on a Manuals Document Transmittal Form. Transmittals are numbered consecutively, and instructions for use are printed on the form.
Amendment Record	The registered holder of the manual records the receipt of all manual document transmittals on the Amendment Record. This record and instructions are found on the reverse side of the manual title page.

GENERAL INFORMATION

Introduction

Overview

Appliance Servicing is a program of study which is consistent with the philosophy and purpose of the institution. The program provides academic foundations in communications, mathematics, and human relations, as well as occupational fundamentals. Program graduates are well trained in the underlying fundamentals of appliance servicing technology and are well prepared for employment and subsequent upward mobility.

The Appliance Servicing program is a specialized training program that provides the student with the knowledge and skills to become a competent appliance servicing technician in the modern appliance servicing field. Skills application plays a vital role in the comprehensive Appliance Servicing program. Important attributes of successful program graduates are critical thinking, problem solving, and the ability to apply knowledge and skills to the work requirement. This field has experienced rapid expansion and the trend is expected to continue for the foreseeable future.

The program structure acknowledges individual differences and provides opportunities for students to seek fulfillment of their respective educational goals. The program does not discriminate on the basis of race, color, national origin, religion, sex, handicapping condition, academic or economic disadvantage.

To assist each student to attain his or her respective potential within the program, both the instructor and the student incur an obligation in the learning process. The instructor is a manager of instructional resources and organizes instruction in a manner which promotes learning. The student assumes responsibility for learning by actively participating in the learning process.

This is a dynamic field which requires extraordinary attention to current curriculum and up-to-date instructional equipment, materials and processes. The Appliance Servicing program must promote the concept of change as the appliance servicing field evolves. The need for nurturing the spirit of involvement and lifelong learning is paramount in the field of appliance servicing.

GENERAL INFORMATION

Introduction

Standard Curriculum

The Appliance Servicing program guide presents the standard appliance servicing curriculum for technical institutes in Georgia. This curriculum addresses the minimum competencies for the Appliance Servicing program. The competency areas included in a local Appliance Servicing program may exceed what is contained in this program guide, but it must encompass the minimum competencies contained herein.

As changes occur in the Appliance Servicing program, this guide will be revised to reflect those changes. Proposed changes are first evaluated and approved by the local program advisory committee and then forwarded to the State Technical Committee for approval and inclusion in the state standard program guide.

This program guide is designed to relate primarily to the development of those skills needed to become an appliance service technician.

GENERAL INFORMATION

Introduction

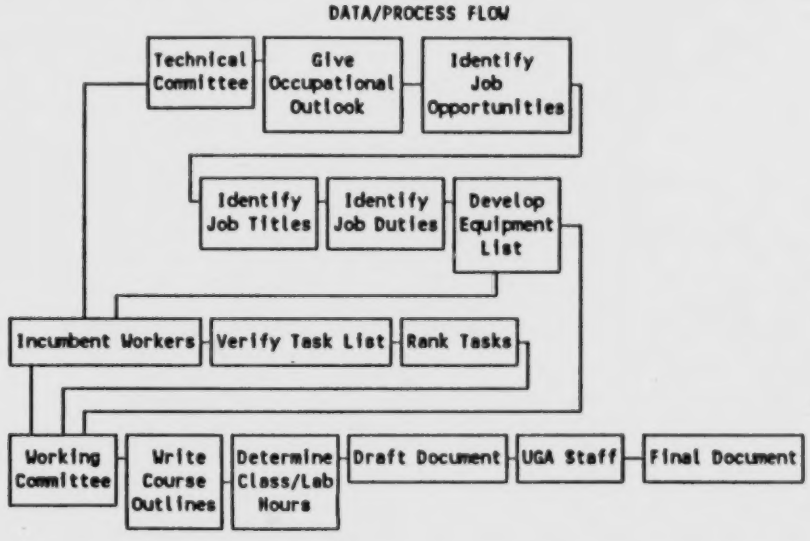
Developmental Process

The development of the Appliance Servicing program guide was based on the premise that the people in the industry can best determine program needs. With this in mind, representatives from businesses which would employ program graduates were asked to serve on a State Technical Committee to help identify the occupational content and to provide overall guidance to ensure that the resulting program would produce graduates qualified for entry-level occupational positions in the industry.

The State Technical Committee verified an occupational task list that had been compiled through extensive research. These representatives included workers who had actually performed the duties and tasks being verified.

Technical institutes which would implement the curriculum were also included in the developmental effort. Representatives from the technical institutes provided the expertise in teaching methodology unique to each discipline and developed the courses contained in this program guide.

The University of Georgia coordinated and directed the development of the curriculum and produced the final program guide. The role of each group in the developmental process is shown in the following diagram.



GENERAL INFORMATION

Introduction

Purpose and Objectives

Purpose

The purpose of the Appliance Servicing program is to provide educational opportunities to individuals that will enable them to obtain the knowledge, skills, and attitudes necessary to succeed in the field of appliance servicing.

The Appliance Servicing program provides educational opportunities regardless of race, color, national origin, religion, sex, age, handicapping condition, academic disadvantage, or economic disadvantage.

The Appliance Servicing program is intended to produce graduates who are prepared for employment as appliance servicing technicians. Program graduates are to be competent in the general areas of communications, math, and interpersonal relations.

Graduates are to be competent in the occupational areas of refrigeration, electrical, and appliance controls fundamentals; electric motors; laundry appliances; kitchen appliances; refrigeration appliances; and microwave ovens.

Objectives

1. Provide current curriculum, instructional materials, and equipment (in accordance with available funding) which teach knowledge, skills, and attitudes appropriate to industry needs.

2. Provide educational facilities which foster learning and provide safe, healthy environments available and accessible to all students who can benefit from the program.

3. Provide academic instruction which supports effective learning within the program and which enhances professional performance on the job.

4. Provide employability skills which foster work attitudes and work habits that will enable graduates of the program to perform as good employees.

5. Nurture the desire for learning so that graduates will pursue their own continuing education as a lifelong endeavor.

6. Provide an educational atmosphere which promotes a positive self image and a sense of personal well being.

7. Provide education that fosters development of good safety habits.

8. Provide admission, educational, and placement services without regard to race, color, national origin, religion, sex, age, or handicapping condition.

9. Provide information to the public regarding the program that will facilitate recruitment and enrollment of students.

10. Promote good public relations via contacts and regular communications with business, industry, and the public sector.

11. Promote faculty and student rapport and communications to enhance student success in the program.

GENERAL INFORMATION

Program Description

Program Defined

The Appliance Servicing program prepares students for employment in a variety of positions in today's appliance servicing profession. The Appliance Servicing program provides learning opportunities which introduce, develop, and reinforce academic and occupational knowledge, skills, and attitudes required for job acquisition, retention, and advancement. Graduates of the program receive an Appliance Servicing diploma.

GENERAL INFORMATION

Program Description

Admissions

Admissions Requirements

Admission of new students to the Appliance Servicing program is contingent upon their meeting all of the following requirements:

a) attainment of 16 or more years of age;
b) achievement of the 8th grade level in reading, English, and math as shown on a statistically validated test; and
c) completion of application and related procedures.

Admission of transfer students is contingent upon their meeting the following:

a) regular admission and good standing at a regionally accredited diploma or degree granting institution; and
b) proper completion of application and related procedures.

Provisional Admission

A new student who does not meet the regular admission requirements of the program may be admitted on a provisional basis. The requirements for provisional admission are:

a) attainment of 16 or more years of age;
b) achievement of the 7th grade level in reading, English, and math as shown on a statistically validated test; or recommendation by program faculty and designated admissions personnel on the basis of interview and assessment of student potential; and
c) completion of application and related procedures.

GENERAL INFORMATION

Program Description

Typical Job Titles

The Appliance Servicing program is assigned a (PGM) CIP code of (PGM) 47.0106 and is consistent with all other programs throughout the state which have the same (PGM) CIP code. The related D.O.T. job titles follow:

723.381-010	Electrical-appliance repairer (any industry), appliance-service representative, small appliance repairer
723.381-014	Vacuum cleaner repairer (any industry)
723.584-010	Appliance repairer (electrical equipment)
827.261-010	Electrical-appliance servicer (any industry), appliance-service representative
827.584-010	Electrical-appliance preparer (any industry), uncrater

GENERAL INFORMATION

Program Description

Accreditation and Certification

This program must conform to the institutional accreditation requirements of the Southern Association of Colleges and Schools by meeting Commission on Colleges (COC) or Commission on Occupational Education Institutions (COEI) accreditation requirements and must not conflict with the accreditation criteria established by COC and COEI.

GENERAL INFORMATION

Curriculum Model

Standard Curriculum

The standard curriculum for the Appliance Servicing program is set up on the quarter system. Two suggested sequences for the program are given below. Technical institutes may implement the Appliance Servicing program using one of the sequences listed below or using a locally developed sequence designed to reflect course prerequisites and/or corequisites.

Course		Class Hours	Lab Hours	Weekly Contact Hours	Credits
SUGGESTED SEQUENCE I					
FIRST QUARTER					
ACT 100	Refrigeration Fundamentals	3	2	5	4
ACT 103	Electrical Fundamentals	7	3	10	8
ACT 104	Electric Motors	2	3	5	3
ELT 101	Safety	2	1	3	2
MAT 101	General Mathematics	5	0	5	5
		19	9	28	22
SECOND QUARTER					
APS 100	Appliance Controls Fundamentals	2	3	5	3
APS 101	Laundry Appliances I	2	6	8	4
APS 105	Refrigeration Appliances I	2	6	8	4
ENG 100	English	5	0	5	5
XXX XXX	Occupational or Occupationally Related Electives	-	-	-	3
		11	15	26	19

Course			Class Hours	Lab Hours	Weekly Contact Hours	Credits
THIRD QUARTER						
APS	102	Laundry Appliances II	1	6	7	3
APS	103	Kitchen Appliances I	2	6	8	4
APS	107	Microwave Ovens	2	6	8	4
PSY	100	Interpersonal Relations and Professional Development	3	0	3	3
XXX	XXX	Occupational or Occupationally Related Electives	-	-	-	2
			8	18	26	16
FOURTH QUARTER						
APS	104	Kitchen Appliances II	1	6	7	3
APS	106	Refrigeration Appliances II	1	6	7	3
APS	108	Household Appliance Servicing Occupation-Based Instruction	3	8	11	5
CNS	101	Consumer Education	3	0	3	3
			8	20	28	14

Course			Class Hours	Lab Hours	Weekly Contact Hours	Credits
SUGGESTED SEQUENCE II						
FIRST QUARTER						
ACT	103	Electrical Fundamentals	7	3	10	8
APS	100	Appliance Controls Fundamentals	2	3	5	3
ELT	101	Safety	2	1	3	2
APS	101	Laundry Appliances I	2	6	8	4
PSY	100	Interpersonal Relations and Professional Development	3	0	3	3
			16	13	29	20
SECOND QUARTER						
ACT	100	Refrigeration Fundamentals	3	2	5	4
ACT	104	Electric Motors	2	3	5	3
APS	102	Laundry Appliances II	1	6	7	3
MAT	101	General Mathematics	5	0	5	5
ENG	100	English	5	0	5	5
			16	11	27	20
THIRD QUARTER						
APS	103	Kitchen Appliances I	2	6	8	4
APS	105	Refrigeration Appliances I	2	6	8	4
APS	107	Microwave Ovens	2	6	8	4
CNS	101	Consumer Education	3	0	3	3
			9	18	27	15

Course			Class Hours	Lab Hours	Weekly Contact Hours	Credits
FOURTH QUARTER						
APS	104	Kitchen Appliances II	1	6	7	3
APS	106	Refrigeration Appliances II	1	6	7	3
APS	108	Household Appliance Servicing Occupation-Based Instruction	3	8	11	5
XXX	XXX	Occupational or Occupationally Related Electives	-	-	-	5
			5	20	25	16

GENERAL INFORMATION

Curriculum Model

General Core Courses

The general core courses provide students with a foundation in the basic skills which enable them to express themselves more clearly, both orally and in writing, and to perform the mathematical functions required in this occupation. The general core courses for the Appliance Servicing program are listed below.

CNS 101	Consumer Education	3 Credits
ENG 100	English	5 Credits
MAT 101	General Mathematics	5 Credits
PSY 100	Interpersonal Relations and Professional Development	3 Credits

GENERAL INFORMATION

Curriculum Model

Fundamental Occupational Courses

The fundamental occupational courses provide students with a foundation in the area of appliance servicing technology which is needed to progress to the more highly specialized courses in the field of appliance servicing. The fundamental occupational courses are listed below.

ACT 100	Refrigeration Fundamentals	4 Credits
ACT 103	Electrical Fundamentals	8 Credits
ACT 104	Electric Motors	3 Credits
APS 100	Appliance Controls Fundamentals	3 Credits
ELT 101	Safety	2 Credits

GENERAL INFORMATION

Curriculum Model

Specific Occupational Courses

The specific occupational courses build upon the fundamental occupational courses to provide students with the basic knowledge and skill required to work as an appliance servicing technician. The specific occupational courses offered in the Appliance Servicing program are listed below.

APS 101	Laundry Appliances I	4 Credits
APS 102	Laundry Appliances II	3 Credits
APS 103	Kitchen Appliances I	4 Credits
APS 104	Kitchen Appliances II	3 Credits
APS 105	Refrigeration Appliances I	4 Credits
APS 106	Refrigeration Appliances II	3 Credits
APS 107	Microwave Ovens	4 Credits
APS 108	Household Appliance Servicing Occupation-Based Instruction	5 Credits
	Occupational or Occupationally Related Electives	5 Credits

GENERAL INFORMATION

Curriculum Model

Electives

Elective courses are provided to allow for the different levels of prior knowledge and skills brought to the classroom by students with diverse backgrounds, educational attainment, and specialized interests.

Decisions regarding the selection and appropriateness of any elective are made by the student after consultation with the instructor. Courses from other departments may be taken as electives when considered appropriate for a student's academic circumstances and career goals.

GENERAL CORE

CNS 101 - Consumer Education

Course Overview

Course Description

Provides basic financial skills for success in the complex and highly technological contemporary economic environment. Topics include: personal finance, quality product standards, taxes, insurance, employment benefits, and savings and investments.

Competency Areas

Personal Finance
Quality Product Standards
Taxes
Insurance
Employment Benefits
Savings and Investments

Prerequisite

Program admission

Credit Hours

3

Contact Hours Per Week

Class - 3

Lab - 0

GENERAL CORE

CNS 101 - Consumer Education

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
PERSONAL FINANCE		**5**	**0**
Economics	Relate the socioeconomic factors that affect family expenditures.		
Organizing	Record a list of desirable shopping guidelines.		
Budgeting	Analyze a financial plan.		
Consumer credit and awareness	Compare personal or business costs and benefits of credit usage.		
QUALITY PRODUCT STANDARDS		**15**	**0**
Appliances, energy, and utilities	Explain laws and agencies which protect and assist consumers.		
	Explain the decision making process.		
Housing, furnishings	Compare housing options for individuals or families.		
Food, clothing, personal health care	Determine family health care needs.		
	Develop guidelines for purchasing textiles or household durables.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Determine family needs for purchasing food.		
Transportation	Compare personal transportation and energy needs.		
Advertising and buying	Determine the effects of marketing strategies on personal consumption.		
TAXES		**2**	**0**
State sales tax Local sales tax State income tax Federal income tax Social Security (FICA) Real estate Ad valorem	Explain the various types of taxes and how they affect net income and budgeting.		
INSURANCE		**3**	**0**
Life insurance Health insurance Automobile insurance Homeowners insurance	Determine personal or business insurance needs by comparing available plans.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
EMPLOYMENT BENEFITS		**2**	**0**
Employer Employee	Explain the various types of employee benefits and how they affect net income of employer and employee.		
SAVINGS AND INVESTMENTS		**3**	**0**
Saving, banking, and kinds	Compare saving and investment options according to personal needs.		
Estate planning	Discussing essentials in writing wills and funeral plans.		
Basic investing	Explain the various types of investments.		
	Describe a stock market report.		

GENERAL CORE

CNS 101 - Consumer Education

Resources

Forms

Federal income tax forms and explanation publications
State income tax forms
County real estate and automobile taxes forms

Brochures

Banks and savings and loan associations
Insurance companies

Magazines

Consumer Reports

GENERAL CORE

ENG 100 - English

Course Overview

Course Description

Emphasizes the development and improvement of written and oral communications abilities. Topics include: basic grammar; language usage; vocabulary; idea development; spelling; outlining; sentence elements; sentence development; paragraph development; revision; listening skills; reading skills; and locating, using, and organizing information. Homework assignments reinforce classroom learning.

Competency Areas

Basic Oral Communications
Listening Skills
Basic Grammar and Sentence Skills
Paragraph Development
Reading Skills

Prerequisite

Program admission level English and reading competency

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

ENG 100 - English

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
BASIC ORAL COMMUNICATIONS		**15**	**0**
Telephone etiquette	Recognize effective telephone communication.		
Small group interaction	Participate in group interaction.		
Language registers	Recognize different levels of language.		
Oral presentations	Give oral presentations.		
	Interview and introduce a person.		
	Demonstrate a product or procedure.		
	Convey thoughts in a way that accomplishes desired results.		
	Role play a job-related situation.		
LISTENING SKILLS		**5**	**0**
Listening techniques	Summarize and paraphrase.		
Nonverbal communication	Take accurate notes that summarize material presented.		
	Interpret nonverbal clues.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Directions	Follow directions.		
BASIC GRAMMAR AND SENTENCE SKILLS		**10**	**0**
Nouns, pronouns, verbs, adverbs, adjectives	Use sentence parts correctly.		
Sentence patterns	Recognize basic sentence patterns.		
Sentence structure	Structure sentences effectively.		
Word choice, style, punctuation	Practice peer editing, preferably with word processing.		
PARAGRAPH DEVELOPMENT		**15**	**0**
Topic	Develop a topic sentence.		
Organization	Organize unified details for a paragraph.		
Paragraph elements	Write a paragraph which contains a narrow subject; a controlling idea; relevant, concrete details; and logical organization.		
Revision	Edit and revise paragraphs, preferably using a word processor.		
	Reinforce reading skills through paragraph revision.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
READING SKILLS		**5**	**0**
Library usage	Demonstrate the ability to use library cataloging system.		
Reference usage	Reinforce reading skills through reference usage.		
	Complete a library worksheet on locating various references.		
	Demonstrate the ability to use indexes to find information in professional journals.		

GENERAL CORE

ENG 100 - English

Resources

Printed References

Lewis, S. D., Smith, H., Baker, F., Ellegood, G., Kopay, C., & Tanzer, W. (1988). *Writing skills for technical students* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

VanAlstyne, J. S. (1986). *Professional and technical writing strategies*. Englewood Cliffs, NJ: Prentice Hall.

GENERAL CORE

MAT 101 - General Mathematics

Course Overview

Course Description

Emphasizes mathematical skills that can be applied to the solution of occupational/technical problems. Topics include: properties of numbers, fractions, decimals, percents, ratio/proportion, measurements and conversions, exponents, and geometric and technical formulas. Class includes lectures, applications, and homework to reinforce learning.

Competency Areas

Properties of Numbers
Fractions
Decimals
Percents
Ratio/Proportion
Measurement/Conversions
Exponents and Radicals
Geometric and Technical Formulas

Prerequisite

Program admission level math competency

Credit Hours

5

Contact Hours Per Week

Class - 5

Lab - 0

GENERAL CORE

MAT 101 - General Mathematics

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
PROPERTIES OF NUMBERS		**5**	**0**
Whole numbers	Identify prime and composite numbers.		
	Solve whole number problems using mathematical operations of addition, subtraction, multiplication, division, and powers.		
FRACTIONS		**10**	**0**
Definition of fractions	Define a fraction.		
	Identify proper, improper, and mixed fractions.		
Equivalent fractions	Solve problems relating to equivalent fractions.		
Mathematical operations using fractions	Solve problems requiring multiplication, division, addition, and subtraction of fractions.		
DECIMALS		**5**	**0**
Definition of decimals and place value	Perform mathematical operations using decimals.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Basic operations of mathematics with decimals	Solve problems using decimals, scientific notation, and powers of ten.		
Conversion of fractions to decimals and decimals to fractions			
Powers of ten			
PERCENTS		**5**	**0**
Definition of percents	Work problems using percents dealing with mixtures and interests.		
Conversion between fractions and decimals			
Base-rate-part problems			
Mixture and interest			
RATIO/PROPORTION		**10**	**0**
Definition of rate, ratio, and proportions	Construct and solve problems involving ratios and proportions.		
Variation: direct and inverse	Identify, setup, and solve proportionality problems.		
Measurement and conversion	Solve problems and applications in measurement and conversions.		
Definition of basic units of measurement	Use dimensioning.		
	Convert between measurement systems.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
EXPONENTS AND RADICALS		**5**	**0**
Laws of exponents	Apply laws of exponents to simplify complex exponents expressions.		
Radicals	Find roots of numbers.		
GEOMETRIC AND TECHNICAL FORMULAS		**10**	**0**
Types of formulas	Identify basic two and three dimensional figures.		
	Find the areas of rectangular and circular figures.		
	Solve for volumes of cubes, rectangular solids, and right circular cylinders.		
	Identify, measure, and solve problems using angles.		
	Solve and manipulate basic algebraic and trigonometric formulas.		

GENERAL CORE

MAT 101 - General Mathematics

Resources

Printed References

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GENERAL CORE

PSY 100 - Interpersonal Relations And Professional Development

Course Overview

Course Description

Provides a study of human relations and professional development in today's rapidly changing world that prepares students for living and working in a complex society. Topics include: personal skills required for an understanding of self and others; projecting a professional image; job acquisition skills such as conducting a job search, interviewing techniques, job application, and resume preparation; desirable job performance skills; and desirable attitudes necessary for job retention and advancement.

Competency Areas

Human Relations Skills
Job Acquisition Skills
Job Retention Skills
Job Advancement Skills
Professional Image Skills

Prerequisite

Provisional admission

Credit Hours

3

Contact Hours Per Week

Class - 3

Lab - 0

GENERAL CORE

PSY 100 - Interpersonal Relations And Professional Development

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
HUMAN RELATIONS SKILLS		**6**	**0**
Goal setting	Develop and set personal goals.		
Stress management	Diagnose and respond to own stress level.		
Behavioral problems	Identify strategies to handle difficult behaviors effectively.		
Personal introductions	Make proper introductions.		
Problem solving/decision making	Identify strategies to solve problems/ make decisions.		
JOB ACQUISITION SKILLS		**15**	**0**
Job search	Identify strategies to conduct a job search.		
Career goals	Develop and set career goals.		
Employment documents	Prepare letter of application.		
	Prepare resume/applications.		
	Prepare follow-up letters.		
Interviewing	Demonstrate interviewing techniques.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
JOB RETENTION SKILLS		**3**	**0**
Office relationships	Identify techniques used to work effectively with coworkers.		
Time management	Develop time management strategies.		
JOB ADVANCEMENT SKILLS		**3**	**0**
Performance appraisal	Demonstrate ability to accept counseling positively.		
	Demonstrate ability to negotiate promotion/salary increase.		
Supervisory chain	Explain chain of responsibility.		
PROFESSIONAL IMAGE SKILLS		**3**	**0**
Image	Project professional image.		
Attitude	Project professional attitude.		

GENERAL CORE

PSY 100 - Interpersonal Relations And Professional Development

Resources

Printed References

DuBrin, A. G. (1988). *Human relations--A job oriented approach* (4th ed.). Englewood Cliffs, NJ: Prentice Hall.

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FUNDAMENTAL OCCUPATIONAL

ACT 100 - Refrigeration Fundamentals

Course Overview

Course Description

Introduces basic concepts and theories of refrigeration. Topics include: the laws of thermodynamics, pressure and temperature relationships, heat transfer, the refrigeration cycle, and safety.

Competency Areas

Laws of Thermodynamics
Pressure and Temperature Relationships
Heat Transfer
Refrigeration Cycle
Safety

Prerequisite

Provisional admission

Credit Hours

4

Contact Hours Per Week

Class - 3

D.Lab - 2

FUNDAMENTAL OCCUPATIONAL

ACT 100 - Refrigeration Fundamentals

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
LAWS OF THERMODYNAMICS		**7**	**5**
Definitions of terms and purposes	Identify terms and definitions used in the refrigeration industry.		
PRESSURE AND TEMPERATURE RELATIONSHIPS		**6**	**5**
Definition of pressure	Explain how temperature and pressure relate to refrigeration.		
HEAT TRANSFER		**6**	**5**
Definition of temperature	Solve problems related to heat.		
REFRIGERATION CYCLE		**8**	**5**
System components	Identify refrigeration system components.		
Refrigeration cycle	Explain/trace the basic refrigeration cycle.		
SAFETY		**3**	**0**
General shop safety	Identify shop safety procedures.		
Emergency procedures	Identify potential hazards in the HVAC lab.		

FUNDAMENTAL OCCUPATIONAL

ACT 100 - Refrigeration Fundamentals

Resources

Althouse, A. D., Turnquist, C. H., & Braccianco, A. F. (1988). *Modern refrigeration and air conditioning.* South Holland, IL: Goodheart-Willcox.

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FUNDAMENTAL OCCUPATIONAL

ACT 103 - Electrical Fundamentals

Course Overview

Course Description

Introduction to fundamental electrical concepts and theories as applied to the air conditioning industry. Topics include: AC and DC theory, electric meters, electric diagrams, distribution systems, electrical panels, voltage circuits, code requirements, and safety.

Competency Areas

AC and DC Theory
Electric Meters
Electric Diagrams
Distribution Systems
Electrical Panels
Voltage Circuits
Code Requirements
Safety

Prerequisite

Provisional admission

Credit Hours

8

Contact Hours Per Week

Class - 7

D.Lab - 3

FUNDAMENTAL OCCUPATIONAL

ACT 103 - Electrical Fundamentals

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
AC AND DC THEORY		**20**	**1**
Terms	Define electrical terms such as conductor, insulator, voltage, resistance, amperage, and wattage. Discuss the difference between AC and DC current.		
Ohm's Law	Solve various problems with Ohm's Law.		
Electromagnetism	Discuss how electromagnets are used in electrical applications.		
ELECTRIC METERS		**7**	**2**
Theory	Discuss basic concepts of electrical circuits.		
Types	Explain differences between voltmeter, ammeter, and ohmmeter.		
Application	Test and measure voltage, current, and resistance.		
ELECTRIC DIAGRAMS		**20**	**20**
Theory	Discuss basic concepts of electrical circuits. Identify and select several loads to be used in electrical circuits.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
Electrical symbols	Correctly identify common electrical symbols.		
Series circuits	Construct and operate simple series circuit.		
Parallel circuits	Construct and operate parallel circuit.		
Series-parallel circuit	Construct and operate series-parallel circuit.		
DISTRIBUTION SYSTEMS		5	1
Theory	Discuss how electrical energy is distributed from the power plant to the home.		
Application	Discuss the benefits of underground distribution for electrical energy.		
ELECTRICAL PANELS		5	4
Theory	Discuss optional methods for computing total loads for home or business.		
	Discuss advantages of circuit-breaker-type service electrical panel.		
Application	Install fusible load center for condensing unit.		
VOLTAGE CIRCUITS		5	1
Low-voltage	Discuss the advantage of using the low-voltage circuits.		
	Properly wire a thermostat.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
Line voltage	Discuss how line voltage works through a contactor.		
CODE REQUIREMENTS		**5**	**1**
Theory	Discuss the creation of the National Electrical Code.		
Application	Wire a condensing unit as per the National Electrical Code.		
SAFETY		**3**	**0**
Theory	Discuss the safety concerns involved in working with electricity.		

FUNDAMENTAL OCCUPATIONAL

ACT 103 - Electrical Fundamentals

Resources

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Langely, B. C. (1985). *Control sytems for air conditioning and refrigeration*. Englewood Cliffs, NJ: Prentice Hall.

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FUNDAMENTAL OCCUPATIONAL

ACT 104 - Electric Motors

Course Overview

Course Description

Continues the development of skills and knowledge necessary for application and service of electric motors commonly used by the refrigeration and air conditioning industry. Topics include: diagnostic techniques, capacitors, installation procedures, types of electric motors, electric motor service, and safety.

Competency Areas

Diagnostic Techniques
Capacitors
Installation Procedures
Types of Electric Motors
Electric Motor Service
Safety

Prerequisite/Corequisite

ACT 103

Credit Hours

3

Contact Hours Per Week

Class - 2

D.Lab - 3

FUNDAMENTAL OCCUPATIONAL

ACT 104 - Electric Motors

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
DIAGNOSTIC TECHNIQUES		**3**	**4**
Drive belt and pulley theory	Discuss the four types of belt and pulley drives.		
Safety considerations	Discuss safety concerns found in working with motors, pulleys, and drive belts.		
Belt guards	Inspect the belt guards on lab equipment.		
Belt and pulley installation	Remove belts.		
	Install belts.		
	Remove pulleys.		
	Install pulleys.		
Belt alignment and adjustment	Adjust belt tension, such as v-belts or drive belts.		
	Adjust pulleys.		
	Align motors.		
	Align pulleys.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
CAPACITORS		**1**	**1**
Theory	Define a capacitor.		
	Define the term microfarad.		
Types Application	Discuss the two types of capacitors. Observe the use of capacitors on lab equipment.		
Troubleshooting	Properly test various capacitors with volt-ohm meter and capacitor tester.		
Safety	Demonstrate how to properly discharge capacitor.		
INSTALLATION PROCEDURES		**3**	**5**
Application	Install electric motors.		
TYPES OF ELECTRIC MOTORS		**9**	**10**
Theory	Explain principles of motor operation.		
Identifying motor types	Classify motors used in the HVAC industry.		
Introducing motor applications	Discuss motor applications.		
Starting single phase motors and motor protection devices	Describe methods of starting and protecting electrical motors.		
	Differentiate between motor windings.		
	Connect single phase motor starting components.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Starting three phase motors and motor protection devices	Describe methods of starting and protecting electrical motors.		
	Differentiate between motor windings.		
	Connect three phase motor starting components.		
ELECTRIC MOTOR SERVICE		**3**	**10**
Service and troubleshooting	Check motors for proper rotation.		
	Isolate electric motor malfunctions.		
	Discuss installation of bearings on shafts.		
	Remove electric motor components.		
	Install electric motor components.		
	Remove electric motors.		
	Install electric motors.		
	Remove fans or blowers.		
	Install fans or blowers.		
	Reverse motor current rotation.		
	Measure motor current draw.		
	Reset motor thermal overloads.		
	Test motor running or starting windings.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Test starting or running capacitors.		
	Test transformers.		
	Wire in motors to power source.		
SAFETY		**1**	**0**
	Discuss the safety hazards found in working with electric motors and their components.		

FUNDAMENTAL OCCUPATIONAL

ACT 104 - Electric Motors

Resources

Althouse, A. D., Turnquist, C. H., Bowditch, W. A., & Bowd, K. (1988). *Modern welding.* South Holland, IL: Goodheart.

American Heating, Refrigeration, and Air Engineering. (1986). *Terminology of heating, ventilation, air conditioning, and refrigeration.* Atlanta: Author.

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FUNDAMENTAL OCCUPATIONAL

APS 100 - Appliance Controls Fundamentals

Course Overview

Course Description

Introduces the fundamental theory and operational characteristics of appliance operational control systems. Emphasis is placed on control of temperature, time, speed, pressure, volume, and safety. Topics include: mechanical controls, electrical controls, electronic controls, gas controls, coupling components, safety monitoring circuits, and principles of servicing.

Competency Areas

Mechanical Controls
Electrical Controls
Electronic Controls
Gas Controls
Coupling Components
Safety Monitoring Circuits
Principles of Servicing

Prerequisite/Corequisite

ACT 103

Credit Hours

3

Contact Hours Per Week

Class - 2

D.Lab - 3

FUNDAMENTAL OCCUPATIONAL

APS 100 - Appliance Controls Fundamentals

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
MECHANICAL CONTROLS		**4**	**6**
Sensors	Discuss the function of sensors in washers and dishwashers.		
	Identify types of sensors.		
	Identify the symptoms of malfunctioning sensors.		
	Locate sensors in appliances.		
Switches	Discuss the function of switches in appliances.		
	Identify types of switches.		
	Identify the symptoms of malfunctioning switches.		
	Locate switches in appliances.		
Timers	Discuss the function of mechanical timers in appliances.		
	Identify types of mechanical timers.		
	Identify the symptoms of malfunctioning mechanical timers.		
	Locate mechanical timers in washers, dryers, ovens, and dishwashers.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
Soap dispensers	Locate soap dispensing systems in washers.		
ELECTRICAL CONTROLS		**4**	**6**
Switches	Discuss the purpose of electrical switches used in appliances.		
	Identify types of electrical switches.		
	Identify the symptoms of malfunctioning electrical swithces.		
Timers	Discuss the function of electrical timers in appliances.		
	Identify types of electrical timers.		
	Identify the symptoms of malfunctioning electrical timers.		
	Locate electrical timers in washers, dryers, ovens, and dishwashers.		
Motor starter relays	Discuss the function of motor starter relays used in appliances.		
	Identify types of motor starter relays.		
	Identify the symptoms of malfunctioning motor starter relays.		
	Locate motor starter relays.		
Variable speed controls	Discuss the function of variable speed controls used in appliances.		
	Identify types of variable speed controls.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Identify the symptoms of malfunctioning variable speed controls.		
	Locate variable speed controls in appliances.		
ELECTRONIC CONTROLS		**4**	**6**
Electronic timers	Discuss the function of electronic timers and timing circuits used in appliances.		
	Identify types of electronic timers.		
	Identify the symptoms of malfunctioning electronic timers.		
	Locate electronic timing circuits in appliances.		
Electronic function controls	Discuss the function of electronic function control circuits used in appliances.		
	Identify types of electronic function controls.		
	Identify the symptoms of malfunctioning electronic function controls.		
	Locate power level control circuits for microwave ovens.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
GAS CONTROLS		**2**	**3**
Range orifices	Locate gas range burner orifices.		
Ignition systems and regulators	Discuss the function of ignition systems and regulators used in gas appliances.		
	Identify types of burner ignition systems and gas regulators.		
	Identify the symptoms of malfunctioning ignition systems and gas regulators.		
	Locate gas burner ignition systems in appliances.		
	Locate gas regulators in appliances.		
COUPLING COMPONENTS		**2**	**3**
Washer couplings	Identify the function of couplings in washer appliances.		
	Identify types of couplings in washer appliances.		
	Locate couplings in washer appliances.		
SAFETY MONITORING CIRCUITS		**2**	**3**
Interlock circuits	Identify the function of safety interlock circuits.		
	Identify types of safety interlock circuits.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Locate interlock circuits in appliances.		
PRINCIPLES OF SERVICING		**2**	**3**
Service concepts and practices	List activities performed on service calls.		
	Identify typical customer relations skills.		
	Discuss the work roles and responsibilities of appliance servicers.		
Administrative procedures	Describe typical service call record-keeping procedures.		
	Identify typical service call record-keeping forms.		
	Identify information needed to complete job status reports.		
Equipment use, tool, and parts control	Identify tools and equipment commonly used for on-site appliance servicing.		
	Describe procedures used to requisition parts.		

FUNDAMENTAL OCCUPATIONAL

APS 100 - Appliance Controls Fundamentals

Resources

Printed References

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Whirlpool Corporation. (1988). *Quality - Pass it on, G-16.* LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Calltaker* (Video Cassette No. LIT 677484). LaPorte, IN: Author.

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FUNDAMENTAL OCCUPATIONAL

ELT 101 - Safety

Course Overview

Course Description

Introduces hazards related to the use of electricity, how electrical shock or electrocution occurs, and methods of prevention and treatment. Emphasis is placed on proper use of hand tools, power tools, and equipment to avoid electrical shock, and procedures for first aid and CPR. Topics include: hazards of electricity, safety tools and equipment, and first aid and cardiopulmonary resuscitation methods.

Competency Areas

Hazards of Electricity
Safety Tools and Equipment
First Aid and Cardiopulmonary Resuscitation

Prerequisite

Provisional admission

Credit Hours

2

Contact Hours Per Week

Class - 2

P.Lab - 1

FUNDAMENTAL OCCUPATIONAL

ELT 101 - Safety

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
HAZARDS OF ELECTRICITY		**1**	**0**
Shock, fire, burn, and explosion	List methods of preventing shock, burns, fires, and explosions.		
SAFETY TOOLS AND EQUIPMENT		**15**	**6**
Tools, equipment, and apparel	Discuss use of safety tools and equipment.		
	Discuss appropriate apparel for electricians.		
Using tools and equipment in a safe manner	Demonstrate safe use of hand and power tools.		
	Demonstrate safe use of ladders and scaffolds.		
Handling materials	Demonstrate material handling techniques.		
	Discuss safety zones and safety zone identification.		
Using chemicals safely	Identify types of chemicals used by electricians and their particular safety requirements.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Using professional societies and other organizations as safety resources	Identify the NEC as the primary source for assuring safety requirements related to the electrical industry. List the role and functions of OSHA related to the electrical industry. Identify secondary sources of safety information related to the electrical industry. List the role and functions of OSHA related to the electrical industry.		
FIRST AID AND CARDIOPULMONARY RESUSCITATION		**4**	**4**
Practices	Identify proper first aid and/or CPR practices.		
Emergency plan	Develop an emergency plan for the shop or work site.		

FUNDAMENTAL OCCUPATIONAL

ELT 101 - Safety

Resources

Adams, J. E., & Rockmaker, G. (1985). *Industrial electricity principles & practices.* (3rd ed.). New York: McGraw-Hill.

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SPECIFIC OCCUPATIONAL

APS 101 - Laundry Appliances I

Course Overview

Course Description

Provides knowledge and skills in diagnosis and repair of major household laundry appliances. Emphasis is placed on servicing gas dryers and electric dryers. Topics include: component application and identification, diagnosis and repair of malfunctioning electrical and mechanical components, wiring diagram interpretation, and dryer installation.

Competency Areas

Component Application and Identification
Diagnosis and Repair of Malfunctioning
Electrical and Mechanical Components
Wiring Diagram Interpretation
Dryer Installation

Prerequisite/Corequisite

ACT 103

Credit Hours

4

Contact Hours Per Week

Class - 2

D.Lab - 3

P.Lab - 3

SPECIFIC OCCUPATIONAL

APS 101 - Laundry Appliances I

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
COMPONENT APPLICATION AND IDENTIFICATION		**8**	**10**
Belt drives	Identify laundry appliance drive belts by type and size.		
	Describe the function of laundry appliance drive belts.		
	Identify laundry appliance pulleys and idler assemblies by type and size.		
Drum assemblies	Identify laundry appliance drums, drum rollers, and support bearings.		
	Describe the function of laundry appliance drums, drum rollers, and support bearings.		
Electric dryer components	Identify laundry appliance blower assemblies, cables, heating elements, temperature controls, and motors.		
	Describe the function of laundry appliance blower assemblies, cables, heating elements, temperature controls, and motors.		
Gas dryer components	Identify laundry appliance burner assemblies, ignition systems, and regulators.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Describe the function of laundry appliance burner assemblies, ignition systems, and regulators.		
DIAGNOSIS AND REPAIR OF MALFUNCTIONING ELECTRICAL AND MECHANICAL COMPONENTS		**2**	**30**
Belt drives	Tighten laundry appliance drive belts.		
	Replace laundry appliance drive belts.		
	Determine the serviceability of laundry appliance pulley and idler assemblies.		
	Lubricate laundry appliance pulley shafts and bearings.		
	Lubricate laundry appliance idler shafts and bearings.		
	Replace laundry appliance pulleys, idlers, sheaves, and bearings.		
Drum assemblies	Determine the serviceability of laundry appliance drum, support bearings, and rollers.		
	Replace laundry appliance drums.		
	Lubricate laundry appliance support bearings.		
	Replace laundry appliance support bearings.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Lubricate laundry appliance drum rollers.		
	Replace laundry appliance drum rollers.		
Electrical components	Identify laundry appliance blower assemblies, heating elements, motors, and circuitry components.		
	Describe the function of laundry appliance blower assemblies, heating elements, motors, and circuitry components.		
	Isolate defective laundry appliance components using manufacturers' service manual troubleshooting procedures.		
	Repair or replace laundry appliance blower assemblies, electrical heating elements, motors electrical wiring cables.		
Gas components	Identify hazards associated with laundry appliance gas and exhaust gas leaks.		
	Identify laundry appliance gas dryer ignition systems, burner assemblies, and regulators.		
	Describe the function of laundry appliance gas regulators.		

Recommended Outline	After completing this section, the student will:	Hours Class	Lab
	Test laundry appliance gas burners, ignition systems, and regulators for serviceability.		
	Test laundry appliance gas line couplings for leaks using both electronic devices and soapy water.		
	Service gas ignition systems, gas burner assemblies, gas regulators.		
WIRING DIAGRAM INTERPRETATION		**8**	**15**
Wiring and pictorial diagrams	Identify diagram symbols for components of gas and electric dryers.		
	Interpret dryer schematic wiring diagrams.		
	Interpret dryer pictorial diagrams.		
Timer sequence charts	Interpret dryer timer sequence charts.		
DRYER INSTALLATION		**2**	**5**
Tools and equipment	Select tools and equipment needed for dryer installation using manufacturers' service manuals.		
Manufacturers' installation procedures	Identify manufacturers' recommendations for transporting dryers.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Transporting dryers	Demonstrate equipment lifts, dollies, and appliance hand trucks used to transport dryers.		
Vent and hood	Determine vent and hood sizes needed for specific laundry appliances.		
	Install laundry appliance vents and hoods in a real or simulated installation site.		
Installation	Install electric and gas dryers using manufacturers' instructions.		
Inspecting gas lines	Test couplings of gas lines for leaks.		

SPECIFIC OCCUPATIONAL

APS 101 - Laundry Appliances I

Resources

Printed References

Meyerink, G. (1988). *Appliance servicing handbook* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Whirlpool Corporation. (1988). *Gas basics - Dryer and range burners, G-17.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Gas burners of cloth dryers, L-36.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Reading and understanding wiring diagrams for dryers, L-50.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Servicing procedures for mechanical systems in Whirlpool dryers, L-33.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding laundry electrical controls and components, L-40.* LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Gas basics - Dryers and range burners, L-17* (Video Cassette No. LIT 4314011). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Gas burners for clothes dryers, L-36* (Video Cassette No. LIT 603141). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Reading and understanding wiring diagrams for dryers, L-50* (Video Cassette No. LIT 677741). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Servicing procedures for mechanical systems in Whirlpool dryers, L-33* (Video Cassette No. LIT 6025801). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding laundry electrical controls and components, L-40* (Video Cassette No. LIT 603919). LaPorte, IN: Author.

SPECIFIC OCCUPATIONAL

APS 102 - Laundry Appliances II

Course Overview

Course Description

Continues the development of knowledge and skills in diagnosis and repair of major household laundry appliances. Emphasis is placed on servicing washers. Topics include: component application and identification, diagnosis and repair of malfunctioning electrical and mechanical components, wiring diagram interpretation, and washer installation.

Competency Areas

Component Application and Identification
Diagnosis and Repair of Malfunctioning
Electrical and Mechanical Components
Wiring Diagram Interpretation
Washer Installation

Prerequisite

APS 101

Credit Hours

3

Contact Hours Per Week

Class - 1

D.Lab - 2

P.Lab - 4

SPECIFIC OCCUPATIONAL

APS 102 - Laundry Appliances II

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
COMPONENT APPLICATION AND IDENTIFICATION		**4**	**10**
Water control components	Identify water control components of washers by type, output, and location.		
	Describe the function and operation of washer water control components.		
	Identify laundry appliance water drain and supply lines and connectors by type and size.		
Tub assemblies	Identify washer belts, pulleys, clutches, brake systems, and idlers by type and size.		
	Describe the function and operation of washer clutches and brake systems.		
	Identify washer tub suspension assemblies.		
	Describe the operation of washer tub suspension assemblies.		
	Identify laundry appliance packings, gaskets, and seals.		
	Identify laundry appliance linkage and lever assemblies.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Describe the function of laundry appliance linkage and lever assemblies.		
Transmission components	Identify laundry appliance shaft and bearing assemblies.		
	Discuss the function of laundry appliance shaft and bearing assemblies.		
	Identify laundry appliance shaft couplings, cam assemblies, and universal joints.		
	Discuss the function of washer shaft couplings, cam assemblies, and universal joints.		
	Identify laundry appliance direct drives and variable speed by type and location.		
	Describe the function of direct drives and variable speed drives.		
DIAGNOSIS AND REPAIR OF MALFUNCTIONING ELECTRICAL AND MECHANICAL COMPONENTS		**1**	**30**
Water supply components	Determine the serviceability of laundry appliance circulation and drain pumps, float sensors, water supply controls, temperature switches, and water supply/drain lines and couplings.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Repair/replace laundry appliance circulation and drain pumps, float sensors, water supply controls, temperature switches, and water supply/drain lines and couplings.		
Tub assemblies	Inspect laundry appliance belts, pulleys, and idlers for serviceability.		
	Tighten tub drive belts.		
	Replace washer belts, pulleys, and idlers.		
	Lubricate washer pulley and idler shafts and bearing.		
	Determine the serviceability of laundry appliance clutches, brakes, packings, gaskets, seals, linkages, and levers.		
	Repair/replace laundry appliance clutches, brakes, packings, gaskets, seals, linkages, and levers.		
Transmission	Evaluate the serviceability of laundry appliance bearing and shaft assembly, shaft couplings and universal joints, cam assemblies, centrifugal switch, direct drive, and variable speed controls.		
	Repair/replace laundry appliance bearing and shaft assembly, shaft couplings and universal joints, cam assemblies, centrifugal switch, direct drive, and variable speed controls.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Electrical components	Inspect laundry appliance electrical cables for damage, wear, and continuity.		
	Inspect laundry appliance motors, solenoids, starter relays, timers, and safety interlocks for proper operation.		
	Repair/replace laundry appliance electrical cables, motors, solenoids, starter relays, timers, and safety interlocks.		
WIRING DIAGRAM INTERPRETATION		**4**	**10**
Wiring and pictorial diagrams	Identify symbols for components of washers.		
	Interpret washer schematic wiring and pictorial diagrams.		
Timer sequence charts	Interpret washer timer sequence charts.		
WASHER INSTALLATION		**1**	**10**
Tools and materials	Using manufacturers' service manuals select tools and equipment needed for washer installation.		
Transporting	Identify manufacturers' procedure for transporting washers.		
	Use equipment hydraulic lifts, dollies, and appliance hand trucks to load, transport, and unload washers.		
Installing washers	Install washers using manufacturers' instructions.		

SPECIFIC OCCUPATIONAL

APS 102 - Laundry Appliances II

Resources

Printed References

Meyerink, G. (1988). *Appliance servicing handbook* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Whirlpool Corporation. (1988). *Reading and understanding wiring diagnosis for washers, L-49*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Servicing washer mechanical and water systems above the baseplate, L-42*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Servicing washer mechanical and water systems below the baseplate, L-41*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding laundry electrical controls and components, L-40*. LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Reading and understanding wiring diagnosis for washers, L-49* (Video Cassette No. LIT 677738). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Servicing washer mechanical and water systems above the baseplate, L-42* (Video Cassette No. LIT 677108). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Servicing washer mechanical and water systems below the baseplate, L-41* (Video Cassette No. LIT 677105). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding laundry electrical controls and components, L-40* (Video Cassette No. LIT 603919). LaPorte, IN: Author.

SPECIFIC OCCUPATIONAL

APS 103 - Kitchen Appliances I

Course Overview

Course Description

Introduces the servicing of major kitchen appliances with emphasis on electric and gas ovens and ranges. Topics include: electrical and mechanical control component identification, wiring diagram interpretation, component and control diagnosis, repair and replacement procedures, and oven and range installation.

Competency Areas

Electrical and Mechanical Control
Component Identification
Wiring Diagram Interpretation
Component and Control Diagnosis
Repair and Replacement Procedures
Oven and Range Installation

Prerequisite/Corequisite

ACT 103

Credit Hours

4

Contact Hours Per Week

Class - 2

D.Lab - 3

P.Lab - 3

SPECIFIC OCCUPATIONAL

APS 103 - Kitchen Appliances I

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
ELECTRICAL AND MECHANICAL CONTROL COMPONENT IDENTIFICATION		**5**	**5**
Mechanical range controls	Identify electric and gas range and oven mechanical control switches. Describe the function and operation of electric and gas range and oven mechanical control switches.		
Electrical range controls	Identify electric range and oven controls. Identify electric oven timer-controlled circuits. Identify electric oven self-cleaning circuits. Describe the function and operation of electrical range controls, timer-controlled oven circuitry, and self-cleaning circuitry.		
Electrical components	Identify wiring harnesses, surface elements, oven elements, and thermostats. Describe the function and operation of wiring harnesses, surface elements, oven elements, and thermostats.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Mechanical components	Identify range and oven doors, door gaskets, retaining hardware, vents, and drip pans.		
WIRING DIAGRAM INTERPRETATION		5	5
Wiring and pictorial diagrams	Identify symbols used to represent components of ranges and ovens. Interpret kitchen appliance schematic wiring diagrams. Interpret kitchen appliance pictorial diagrams. Locate range and oven components using pictorial diagrams.		
Timer sequence charts	Interpret kitchen appliance timer sequence charts.		
COMPONENT AND CONTROL DIAGNOSIS		6	40
Electrical components and controls	Test oven, range, and self-cleaning circuits, timers, and thermostats for operation. Inspect kitchen appliance wiring harness, heating elements, and connectors for wear or damage. Identify symptoms of malfunctioning kitchen appliance electrical components.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Mechanical components and controls	Check alignment, range of motion, and freedom of movement of kitchen appliance mechanical components and controls.		
REPAIR AND REPLACEMENT PROCEDURES		**2**	**5**
Electrical range service	Repair/replace range electrical wiring.		
	Replace electrical heating elements for kitchen appliances.		
	Replace electrical surface units for kitchen appliances.		
	Repair/replace oven and surface unit control switches.		
	Replace thermostats for kitchen appliances.		
	Replace timers for kitchen appliances.		
	Repair/replace self-cleaning circuitry for kitchen appliances.		
Gas range service	Service gas range orifices.		
	Service gas range ignition systems.		
	Service gas range regulators.		
	Service gas range safety devices.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
OVEN AND RANGE INSTALLATION		2	5
Combination units	Install gas and electric free-standing, slide-in, and drop-in oven and range units.		
Ranges	Install gas and electric single and multi-surface unit ranges.		
Ovens	Install gas and electric wall-mounted ovens.		

SPECIFIC OCCUPATIONAL

APS 103 - Kitchen Appliances I

Resources

Printed References

Meyerink, G. (1988). *Appliance servicing handbook* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Whirlpool Corporation. (1988). *Gas basics - Dryers and range burners, G-17.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Introduction to Whirlpool gas ranges, KR-3.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Keys to "K" model built-in electric ranges, KR-2.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Manufactured freestanding range diagnosis and repair, KR-1.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Whirlpool self-cleaning gas ranges, KR-5.* LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Gas basics - Dryers and range burners, G-17* (Video Cassette No. LIT 4314011). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Introduction to Whirlpool gas ranges, KR-3* (Filmstrip No. LIT 677845). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Keys to "K" model built-in electric ranges, KR-2* (Filmstrip No. LIT 677790). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Manufactured freestanding range diagnosis and repair, KR-1* (Video Cassette No. LIT 677032). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Whirlpool self-cleaning gas ranges, KR-5* (Filmstrip No. LIT 787274). LaPorte, IN: Author.

SPECIFIC OCCUPATIONAL

APS 104 - Kitchen Appliances II

Course Overview

Course Description

Continues the servicing of major kitchen appliances with emphasis on dishwashers, compactors, and garbage disposals. Topics include: electrical and mechanical control component identification; wiring diagram interpretation; component and control diagnosis; repair and replacement procedures; and dishwasher, compactor, and garbage disposal installation.

Competency Areas

Electrical and Mechanical Control Component Identification
Wiring Diagram Interpretation
Component and Control Diagnosis
Repair and Replacement Procedures
Dishwasher, Compactor, and Garbage Disposal Installation

Prerequisite

APS 103

Credit Hours

3

Contact Hours Per Week

Class - 1

D.Lab - 2

P.Lab - 4

SPECIFIC OCCUPATIONAL

APS 104 - Kitchen Appliances II

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
ELECTRICAL AND MECHANICAL CONTROL COMPONENT IDENTIFICATION		**2**	**5**
Mechanical components and controls	Describe the function of dishwasher, trash compactor, and garbage disposal water level controls, soap dispensing systems, pump assemblies, water distribution systems, cabinet and door hardware, seals and gaskets, and compression and grinding mechanisms.		
Electrical components and controls	Describe the function of water and air drying temperature regulating systems, timers, motors, and interlock controls used in dishwashers, trash compactors, and garbage disposals.		
WIRING DIAGRAM INTERPRETATION		**3**	**5**
Dishwashers	Trace the current flow through energized circuits of dishwashers for each of the operating cycles.		
Trash compactors	Trace the current flow through energized circuits of trash compactors for each of the operating cycles.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Garbage disposals	Trace the current flow through energized circuits of garbage disposals for each of the operating cycles.		
Symbol recognition	Identify the symbols for mechanical and electrical components.		
	Indicate any changeable states represented by a mechanical or electrical symbol.		
Pictorial diagrams	Identify components in pictorial diagrams of dishwashers, trash compactors, and garbage disposals.		
COMPONENT AND CONTROL DIAGNOSIS		3	35
Mechanical components	Describe symptoms of malfunctioning mechanical components in kitchen appliances.		
	Determine action needed to restore operation in malfunctioning systems of kitchen appliances.		
Electrical components	Describe symptoms of malfunctioning electrical components in kitchen appliances.		
	Determine action needed to restore operation in malfunctioning systems of kitchen appliances.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
REPAIR AND REPLACEMENT PROCEDURES		**1**	**5**
Dishwashers	Service dishwasher electrical wiring.		
	Service dishwasher water level control system.		
	Service dishwasher water and dryer temperature control system.		
	Service dishwasher timers.		
	Service dishwasher soap dispensing system.		
	Service dishwasher pump assembly.		
	Service dishwasher water distribution system.		
	Service dishwasher cabinet and door hardware.		
	Service dishwasher seals and gaskets.		
	Service dishwasher motors.		
Trash compactors	Service trash compactors.		
Garbage disposals	Service garbage disposals.		
DISHWASHER, COMPACTOR, AND GARBAGE DISPOSAL INSTALLATION		**1**	**10**
Dishwashers	Prepare opening for installation of the dishwasher.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Install dishwashers.		
	Set up dishwater water supply and plumbing.		
Trash compactors	Prepare opening for installation of the trash compactor.		
	Install trash compactor.		
	Set up electrical service for trash compactor.		
Garbage disposals	Prepare plumbing lines for installation of the garbage disposal.		
	Install garbage disposal.		
	Connect electrical service to garbage disposal.		

SPECIFIC OCCUPATIONAL

APS 104 - Kitchen Appliances II

Resources

Printed References

Meyerink, G. (1988). *Appliance servicing handbook* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Whirlpool Corporation. (1988). *The mechanics of Whirlpool dishwashers, KD-1*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *New and improved dishwasher cycles and circuits, KD-3*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Whirlpool 18" dishwasher, KD-4*. LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *The mechanics of Whirlpool dishwashers, KD-1* (Video Cassette No. LIT 677095). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *New and improved dishwasher cycles and circuits, KD-3* (Video Cassette No. LIT 677616). LaPorte, IN: Author.

SPECIFIC OCCUPATIONAL

APS 105 - Refrigeration Appliances I

Course Overview

Course Description

Provides instruction on the operation, service, and installation of refrigeration appliances. Emphasis is placed on household refrigerators and icemakers. Topics include: identification of sealed-system components, wiring diagram interpretation, sealed-system component service, icemaker service, cabinet component service, and icemaker and refrigerator installation.

Competency Areas

Identification of Sealed-System Components
Wiring Diagram Interpretation
Sealed-System Component Service
Icemaker Service
Cabinet Component Service
Icemaker and Refrigerator Installation

Prerequisite

ACT 104

Credit Hours

4

Contact Hours Per Week

Class - 2

D.Lab - 3

P.Lab - 3

SPECIFIC OCCUPATIONAL

APS 105 - Refrigeration Appliances I

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
IDENTIFICATION OF SEALED-SYSTEM COMPONENTS		**2**	**3**
Refrigerants	Identify types and characteristics of refrigerants.		
	Identify components of various refrigeration systems.		
	Identify rotary and reciprocating compressors and charging systems.		
WIRING DIAGRAM INTERPRETATION		**4**	**12**
Symbol recognition	Identify components on a refrigeration appliance wiring diagram.		
Sequence of operation	Describe the operational state of components for all cycles of refrigeration operation.		
SEALED-SYSTEM COMPONENT SERVICE		**10**	**30**
Using the watt meter	Use a watt meter to analyze a sealed-system refrigeration problem.		
Servicing tubing and connectors	Cut tubing and connectors for refrigeration appliances.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Form tubing and connectors for refrigeration appliances.		
	Braze tubing and connectors for refrigeration appliances.		
Sealed-system service	Operate refrigerator service valves.		
	Analyze refrigeration system with manifold gauges.		
	Diagnose refrigerator sealed-system malfunctions.		
	Test refrigerator lines for leaks.		
	Flush refrigerator sealed-system of contaminants.		
	Service refrigerator compressors.		
	Service refrigerator evaporators.		
	Service refrigerator expansion valves and capillary systems.		
	Service refrigerator filter dryers.		
	Evacuate refrigerator sealed-systems.		
	Recharge refrigeration systems.		
	Clean refrigeration condenser exterior.		
ICEMAKER SERVICE		**2**	**10**
Diagnosis	Diagnose icemaker malfunction.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
	Repair/replace defective icemaker components.		
	Check icemaker for correct operation using manufacturers' specifications.		
CABINET COMPONENT SERVICE		**1**	**3**
Electrical components	Service electrical wiring.		
	Service capacitors.		
	Service current relays.		
	Service overload protectors.		
	Service potential relays.		
	Service evaporator fan motors.		
	Service condenser fan motors.		
	Service thermostats.		
	Service cabinet and door hardware.		
	Service door gaskets.		
Reversing door hinges	Change doors to open on the opposite side.		
Drain line and drip pan	Confirm that drain line is free of obstructions.		
	Remove/replace drip pan.		
	Clean drip pan.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Strip heaters	Confirm operation of strip heaters.		
	Repair/replace strip heaters.		
Cabinet level	Adjust cabinet level.		
ICEMAKER AND REFRIGERATOR INSTALLATION		**1**	**2**
Size of opening for refrigerators	Confirm that icemaker or refrigerator opening meets manufacturers' requirements for air flow.		
Icemaker plumbing	Plumb icemaker water line as recommended by manufacturer.		
Electrical requirements	Assure that refrigerator and other appliance ampere load does not exceed service limits.		
	Identify tools and equipment needed for on-site kitchen appliance servicing.		
	Select tools and equipment for on-site kitchen appliance servicing.		
	Install refrigerators and icemakers.		

SPECIFIC OCCUPATIONAL

APS 105 - Refrigeration Appliances I

Resources

Printed References

Althhouse, A. D., Turnquist, C. H., & Bracciano, A. F. *(1988). Modern refrigeration and air conditioning* (5th ed.). South Holland, IL: Goodheart-Willcox.

Meyerink, G. (1988). *Appliance service handbook*. Englewood Cliffs, NJ: Prentice Hall.

Whirlpool Corporation. (1988). *Brazing tools and test equipment, R-44*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Fundamentals and diagnosis, R-43*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Interior and exterior moisture on refrigeration products, R-57*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Refrigeration electrical controls, R-31*. LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Sweep charge sealed-system charging procedure, R-56*. LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Compressor replacement* (Video Cassette No. LIT 677528). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Delivery and installation of Whirlpool refrigerators* (Video Cassette No. LIT 677651). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Interior and exterior moisture on refrigeration products, R-57* (Filmstrip LIT 677946 and Cassette Tape LIT 787142). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Refrigeration interior and exterior moisture* (Video Cassette No. LIT 677947). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Sweep charge sealed-system changing procedure* (Video Cassette No. LIT 677910). LaPorte, IN: Author.

SPECIFIC OCCUPATIONAL

APS 106 - Refrigeration Appliances II

Course Overview

Course Description

Continues instruction on the operation, service, and installation of refrigeration appliances. Emphasis is placed on household refrigerators and icemakers. Topics include: identification of sealed-system components, wiring diagram interpretation, sealed-system component service, icemaker service, cabinet component service, and window air conditioner and dehumidifier installation.

Competency Areas

Identification of Sealed-System Components
Wiring Diagram Interpretation
Sealed-System Component Service
Icemaker Service
Cabinet Component Service
Window Air Conditioner and Dehumidifier Installation

Prerequisite

APS 105

Credit Hours

3

Contact Hours Per Week

Class - 1

D.Lab - 2

P.Lab - 4

SPECIFIC OCCUPATIONAL

APS 106 - Refrigeration Appliances II

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
IDENTIFICATION OF SEALED-SYSTEM COMPONENTS		1	4
Refrigerants	Identify types and characteristics of refrigerants used in icemakers, window air conditioners, and dehumidifiers.		
	Identify components of various refrigeration systems used in icemakers, window air conditioners, and dehumidifiers.		
	Identify rotary and reciprocating compressors and charging systems used in icemakers, window air conditioners, and dehumidifiers.		
WIRING DIAGRAM INTERPRETATION		1	3
Symbol recognition	Identify components on wiring diagrams for icemakers, window air conditioners, and dehumidifiers.		
Sequence of operation	Describe the operational state of components for all cycles of operation of icemakers, window air conditioners, and dehumidifiers.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
SEALED-SYSTEM COMPONENT SERVICE		**4**	**30**
Checking power	Use a watt meter to analyze a sealed-system problem in icemakers, window air conditioners, and dehumidifiers.		
Servicing tubing and connectors	Cut tubing and connectors for icemakers, window air conditioners, and dehumidifiers.		
	Form tubing and connectors for icemakers, window air conditioners, and dehumidifiers.		
	Braze tubing and connectors for icemakers, window air conditioners, and dehumidifiers.		
Sealed-system servicing	Service condensers, evaporators, and window metering devices for air conditioners and dehumidifiers.		
	Service compressors for air conditioners and dehumidifiers.		
ICEMAKER SERVICE		**1**	**4**
Diagnosis and repair procedures	Diagnose icemaker malfunctions.		
	Repair/replace defective icemaker components.		
	Service icemaker electrical wiring.		
	Check icemaker for correct operation using manufacturers' specifications.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
CABINET COMPONENT SERVICE		**1**	**4**
Electrical components	Service window air conditioner and dehumidifier fan motors.		
	Service window air conditioner and dehumidifier capacitors.		
	Service window air conditioner and dehumidifier function selection switches.		
	Service window air conditioner and dehumidifier thermostat and temperature control circuits.		
	Service window air conditioner and dehumidifier electrical wiring.		
Mechanical components	Service icemaker, window air conditioner, and dehumidifier cabinet and door hardware.		
	Service icemaker door gaskets.		
WINDOW AIR CONDITIONER AND DEHUMIDIFIER INSTALLATION		**2**	**15**
Electrical requirements	Assure that appliance ampere load does not exceed service limits for window air conditioners and dehumidifiers.		
	Request installation of separate electrical service as needed for window air conditioners and dehumidifiers.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Window air conditioner installation	Confirm structural integrity of window air conditioner installation site.		
	Calculate room air conditioning requirements.		
	Mount window air conditioner according to manufacturer instructions and local code requirements.		
Dehumidifier installation	Determine adequacy of power supply for dehumidifier installation.		
	Install water drain on non-portable dehumidifiers.		
	Mount window air conditioner according to manufacturer instructions and local code requirements.		

SPECIFIC OCCUPATIONAL

APS 106 - Refrigeration Appliances II

Resources

Printed References

Whirlpool Corporation. (1988). *Air conditioner sizing and performance testing, R-46.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Room air conditioner diagnosis, R-48.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Room air conditioner fundamentals, R-47.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding and servicing the compact icemaker, R-40.* LaPorte, IN: Author.

Whirlpool Corporation. (1989). *Part II, refrigeration* (Course 602704). LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Air conditioner sizing and performance testing, R-46* (Filmstrip No. LIT 677301 and Cassette Tape No. LIT 677302). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Room air conditioner diagnosis, R-48* (Filmstrip No. LIT 677418 and Cassette Tape No. 677419). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Room air conditioner fundamentals, R-47* (Filmstrip No. LIT 677415 and Cassette Tape No. 677416). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding and servicing the compact icemaker, R-40* (Filmstrip No. LIT 603358 and Cassette Tape No. LIT 603359). LaPorte, IN: Author.

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SPECIFIC OCCUPATIONAL

APS 107 - Microwave Ovens

Course Overview

Course Description

Introduces the use of tools, materials, and service procedures to restore electronic circuits of microwave ovens to safe, full-range operation. Emphasis is placed on the fundamental theory and practical application of electronic components to appliance circuits. Topics include: microwave theory, circuit symbols and schematics, radiation leakage measurement, safety interlocks, electrical and electronic components, and service practices.

Competency Areas

Microwave Theory
Circuit Symbols and Schematics
Radiation Leakage Measurement
Safety Interlocks
Electrical and Electronic Components
Service Practices

Prerequisites

ACT 103, ACT 104, and program admission

Credit Hours

4

Contact Hours Per Week

Class - 2

D.Lab - 3

P.Lab - 3

SPECIFIC OCCUPATIONAL

APS 107 - Microwave Ovens

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
MICROWAVE THEORY		**3**	**0**
Historical development	Describe the historical development of microwave oven technology.		
Spectrum of operation	Identify the range of radio frequencies that microwave ovens emit.		
Myths	Explain myths relating to microwave generation.		
	Describe microwave oven factual operational conditions.		
CIRCUIT SYMBOLS AND SCHEMATICS		**4**	**0**
Electrical symbols	Identify electrical components of microwave ovens using symbols in schematic diagrams.		
	Describe the function of electrical components in microwave ovens.		
Electronic symbols	Identify electronic components of microwave ovens using symbols in schematic diagrams.		
	Describe the function of electronic components in microwave ovens.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Integrated circuit symbols	Identify integrated circuit components of microwave ovens using symbols in schematic diagrams. Describe the function of electronic components in microwave ovens.		
RADIATION LEAKAGE MEASUREMENT		**3**	**10**
Measurement instruments	Identify test equipment for microwave oven function and component testing.		
Federal guidelines	Relate minimum acceptable operational characteristics for microwave ovens as presented by federal guidelines.		
SAFETY INTERLOCKS		**3**	**10**
Components	Identify the components used in microwave oven interlock circuitry. Describe the function of components used in microwave oven interlock circuitry.		
Interlock circuit	State conditions which interrupt the operation of microwave oven interlock circuitry.		
Servicing practice	Service microwave oven interlock circuits. Service microwave cabinet hardware.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
ELECTRICAL AND ELECTRONIC COMPONENTS		**4**	**10**
Electrical terminology and applications	Identify transformers, capacitors, fan motors, and turntable motors used in microwave ovens.		
	Describe the function of transformers, capacitors, fan motors, and turntable motors used in microwave ovens.		
Electronic terminology and applications	Identify magnetron tubes, TRIAC circuit rectifiers, transistors, silicon controlled rectifiers, varistors, and thermistors used in microwave ovens.		
	Describe the function of magnetron tubes, TRIAC circuit rectifiers, transistors, silicon-controlled rectifiers, varistors, and thermistors used in microwave ovens.		
SERVICE PRACTICES		**3**	**30**
Components	Service microwave oven power level control circuits.		
	Service microwave oven timing circuits.		
	Service microwave oven cabinet hardware.		
	Service microwave oven magnetron tube circuits.		

Recommended Outline	After completing this section, the student will:	Hours Class	Hours Lab
Safety practices	Identify safe working practices to use when servicing microwave ovens. Conform to safe working practices during performance of microwave oven service operations.		

SPECIFIC OCCUPATIONAL

APS 107 - Microwave Ovens

Resources

Printed References

Mid-America Vocational Curriculum Consortium. (1986). *Microwave oven repair.* Stillwater, OK: Author.

Whirlpool Corporation. (1988). *Diagnosis and repair of Whirlpool microwave ovens, KM-2.* LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding Whirlpool electronic control microwave ovens, KM-4.* LaPorte, IN: Author.

Whirlpool Corporation. (1989). *Fundamentals of Whirlpool microwave ovens, KM-1.* LaPorte, IN: Author.

Audiovisuals

Mid-America Vocational Curriculum Consortium. (1986). *Microwave oven repair* (Transparency Set No. 601303). Stillwater, OK: Author.

Whirlpool Corporation. (1988). *Diagnosis and repair of Whirlpool microwave ovens, KM-2* (Filmstrip No. LIT 603702 and Cassette Tape No. LIT 603704). LaPorte, IN: Author.

Whirlpool Corporation. (1988). *Understanding Whirlpool electronic control microwave ovens, KM-4* (Filmstrip No. LIT 677308 and Cassette Tape No. LIT 677309). LaPorte, IN: Author.

Whirlpool Corporation. (1989). *Fundamentals of Whirlpool microwave ovens, KM-1* (Filmstrip No. LIT 603433 and Cassette Tape No. LIT 603435). LaPorte, IN: Author.

SPECIFIC OCCUPATIONAL

APS 108 - Household Appliance Servicing Occupation-Based Instruction

Course Overview

Course Description

Introduces student to household appliance service requirements in an actual job placement or practicum experience. Students undertake job responsibilities through realistic work situations and complete the tasks necessary to conduct appliance service operations. Topics include: customer relations, service call records maintenance, service call requirement estimation, service call planning, safety, and equipment and supplies management.

Competency Areas

Customer Relations
Service Call Records Maintenance
Service Call Requirement Estimation
Service Call Planning
Safety
Equipment and Supplies Management

Prerequisite

APS 107

Credit Hours

5

Contact Hours Per Week

Class - 3

O.B.I. - 8

SPECIFIC OCCUPATIONAL

APS 108 - Household Appliance Servicing Occupation-Based Instruction

Course Outline

Recommended Outline	After completing this section, the student will:	Hours Class	Hours OBI
CUSTOMER RELATIONS		**5**	**15**
Product orientation	Demonstrate the operation and care of appliances.		
Administrative procedures	Demonstrate how to complete warranty cards/records.		
Complaint response	Demonstrate tactful response to possible customer complaints.		
SERVICE CALL RECORDS MAINTENANCE		**5**	**15**
Initiating service call records	Write a service call job order for a real or simulated call in request.		
Record repair/ replacement action	Complete a service call record to reflect action take in on a real or simulated service call.		
	Record time and materials used in a real or simulated restoration.		
Accounts receivable	Complete billing records required by typical business office.		
SERVICE CALL REQUIREMENT ESTIMATION		**5**	**15**
Problem analysis	Check real or simulated work order to determine cause of failure.		

Recommended Outline	After completing this section, the student will:	Hours Class	OBI
Identify service procedures	Identify service manuals to determine specific maintenance procedures.		
Select repair method	List possible restorative procedures.		
Identify tools, equipment, and repair parts	Identify tools and equipment needed for on-site appliance servicing.		
Cost	Estimate repair time and cost of a real or simulated service call.		
SERVICE CALL PLANNING		**5**	**15**
Planning the service call	Use real or simulated work order to determine a troubleshooting strategy.		
	Identify applicable legal codes governing appliance installations.		
	Select tools and equipment for on-site or simulated service call.		
	Plan a typical service call.		
Transportation	Read maps to locate real or simulated service call site.		
SAFETY		**5**	**(80)**
Loading materials	Observe safe working practices when loading tools, equipment, supplies, and appliances.		
Repair procedures	Conform to safe work practices while servicing appliances.		

Recommended Outline	After completing this section, the student will:	Hours Class	OBI
	Identify the procedures for maintaining a safe work environment for self and others.		
	Describe how to restore work area to clean and safe condition.		
EQUIPMENT AND SUPPLIES MANAGEMENT		**5**	**20**
Equipment	Discuss how to maintain an equipment inventory.		
	Describe how to unpack new equipment.		
	Describe method used to inspect new equipment.		
Tools	Describe typical tool crib procedures.		
	Identify tools and equipment needed for typical on-site appliance servicing.		
Parts control	Describe typical parts ordering procedures.		
	Prepare a typical parts order for real or simulated call.		
	Describe part inventory control procedures.		
References	Describe the procedures used to update service manuals, schematics, and wiring diagrams.		

SPECIFIC OCCUPATIONAL

APS 108 - Household Appliance Servicing Occupation-Based Instruction

Resources

Printed References

Davis, E. G. (1984). *Customer relations for technicians.* New York: McGraw-Hill.

Meyerink, G. (1988). *Appliance service handbook* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Whirlpool Corporation. (1988). *Customer relations for appliance technicians, G-15.* LaPorte, IN: Author.

Audiovisuals

Whirlpool Corporation. (1988). *Customer relations for appliance technicians, G-15* (Video Cassette No. LIT 787045). LaPorte, IN: Author.

APPENDICES

APPENDIX A

Appliance Servicing

Tools and Equipment List

Amprobe
Analyzer, capacitance
Awl, scratch
Bar, extension, 2", 4", 6", length,
1/4", 3/8", 1/2" drive
Bender, metal, spring, assorted
Bender, tube
Bit, expansion
Bits, drill, #80 to 1/2"
Blades, hacksaw
Box, tool
Brush, steel
Can, oil
Charger, refrigeration, dial-a-charge
Chisel, cord, 6", 9"
Chisel, wood, assorted
Cleaner, vacuum/blower, wet-dry
Cloth, drop, flame-retardant
Comb, fin
Cord, test, fused *
Cord, extension, grounded
Crimpers, metal pipe
Crimpers, terminal
Cutter, mini-tube
Cutter, pipe, steel
Cutter, tubing
Detector, leak, aerosol
Detector, leak, electronic
Detector, leak, halide
Dope, pipe
Drill, electric, variable speed,
reversible, 3/8" chuck
Drill, star, 1/4", 3/8", 1/2"
Dropcloth, floor, heat/flame resistant
Extinguisher, fire
Fasteners, assorted

Files, assorted 10" and 3 corner
Flashlight
Gauge, cam
Gauge, depth, dial indicating
Gauge, feeler
Gauge, micron
Gauge, vacuum
Glass, measuring
Glasses, safety
Gloves, flame retarding
Grease, high temperature
Gun, grease, hand, cartridge
Gun, heat *
Gun, staple *
Hammer, assorted
Handle, file
Handle, ratchet, socket wrench,
1/4", 3/8", 1/2" drives
Hat, hard
Hose, hot water
Iron, soldering, electric, 150 watt
Iron, soldering, electric, pencil, 25 watt
Joint, universal, 3/8" drive
Kit, first aid
Kit, flaring, 3/16" to 5/8"
Kit, hole saw (wood)
Kit, microwave test
Kit, swage, 3/16" to 7/8"
Kit, torch, brazing, propane
Kit, torch, fuel/ox, portable
Knife, combination blade, pocket
Knife, putty, 1"
Ladder, step, wood, 6'
Lamp, neon, test
Level, 3" or 5"
Light, drop, with lamp shield
Mallet, assorted
Manometer
Meter, volt-ohm-milliampere, digital
or analog indicating *
Meter, watt *
Mirror

Mirror, inspection
Nozzle, hose
Pliers, diagonal, cutting *
Pliers, lineman *
Pliers, needle nose 6" *
Pliers, retaining ring (tru-arc)
Pliers, vicegrip, 6", 8", 10"
Pliers, water pump
Puller, gear
Puller, fuse *
Pump, vacuum, 29.8" HG, certified
Punch, center, assorted
Punch, drift, assorted
Punches, pin, assorted
Rags, wiping
Reamer, pipe
Recorder, chart, time/temperature
Remover, seal
Remover, valve core
Rod, flexible, magnet tip, 36"
Rope
Rule, folding, 6'
Saw, jig/keyhole *
Saw, hack
Saw, reciprocating blade, electric, variable speed *
Screwdriver, thermostat adjusting
Screwdriver, assorted, common blade
Screwdriver, assorted, Phillips
Screwdriver, offset, common
Screwdriver, offset, Phillips
Screwstarter, blade and 3-prong
Set, cord, test adapter *
Set, file, Swiss pattern
Set, hole punch, 1/2" to 1-1/2"
Set, manifold and gauges, refrigeration
Set, nutdriver, 1/8" to 1/2"
Set, socket, 1/8" to 3/4"
Set, socket, deep, 1/8" to 3/4"
Set, tap and die, pipe
Set, tap and die, screw
Set, wrench, box end, metric

Set, wrench, box end, SEA
Set, wrench, hex-head, (Allen)
Set, wrench, open end, metric
Set, wrench, open end, SEA
Snips, tin, right and left
Socket, valve stem
Square, steel, 12"
Striker
Stripper, wire *
Studfinder
Tape, metal, measuring, 50'
Tester, thermocouple
Thermometer, HG, low temp/hi temp
Thermometer, oven
Thermometer, plenum, pocket
Thermometer, refrigeration
Tool, pinch off, hose
Tool, pop-rivet
Tool, seal insulation
Truck, hand
Tape, fish
Wrench, end, adjustable, 6", 10", 12"
Wrench, end, assorted
Wrench, pipe, 6", 10", 14"
Wrench, ratchet, refrigeration
Wrench, torque, 3/8", 1/2"
Wrench, valve, gas

* = insulated tool

APPENDIX A

Appliance Servicing

Standard Tool Kit Contents

Adhesive, gasket
Allen wrench set, short and long lengths
Amprobe
Box 12", extension
Brush, dusting
Burnisher (relay contact)
Can, oil
Cord, test, fused*
Cutter, tube HD with reamer
Feeler gauge
File, small, assorted
File, flat
File, round
File, small, assorted
Flashlight, magnetic
Glasses, safety
Hacksaw with blades
Hammer, ballpeen
Inspection mirror
Knife, electrician
Manifold, ressive gauges and hoses
Meter (18 range 2000 OHM/V)
Nutdrivers, 3/16"-1/2", hollow shaft
Pliers, long chain nose
Pliers, diagonal cutting
Pliers, needle nose
Pliers, lineman
Pliers, channel lock
Powered screwdriver, with accessories
Puller, fuse
Punch, center
Remover, valve core
Scale (6" Eng/metric)
Scissors
Screwdrivers, Phillips, assorted
Screwdrivers, common assorted

Screwdrivers, offset, common and Phillips
Set, chisel and punch
Set, hex key
Set, soldering
Socket set, 3/16-1"
Stripper/crimper, wire
Tape, electrical
Tape, rule, 16 foot
Tester, continuity
Thermometer, dial, pocket
Thermometer, oven
Tool, alignment
Wires, jumper, assorted lengths
Wrenches, adjustable
Wrenches, combination

* = insulated tool

APPENDIX B

Appliance Servicing

Additional Resource Material

Bacon, B., & Sutton, M. (1981). *Major appliance repairer.* Austin, TX: University of Texas, Austin, Extension Instruction and Materials Center.

Bartch, J. H. (1987). *School materials safety manual.* Schenectedy, NY: Genium.

Miller, R. (1983). *Refrigeration and air conditioning technology.* Mission Hills, CA: Glencoe.

Miller, R. (1983). *Refrigeration student guide.* Mission Hills, CA: Glencoe.

Miller, R. (1983). *Refrigeration teacher's guide.* Mission Hills, CA: Glencoe.

National Institute for Occupational Safety and Health (NIOSH). (1981). *Work practices guide for manual lifting.* Cincinatti: Author.

Vocational-Technical Education Consortium of States. (1980). *Appliance repairer: A catalog of tasks, performance objectives, performance guides, tools, and equipment.* Atlanta: Author.

Watkins, J. F. (1981). *Appliance repair postsecondary curriculum guide.* Atlanta: Office of Adult and Vocational Education.

Whirlpool Corporation. (1988). *Service pointers: Commercial laundry products.* LaPorte, IN: Author.

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